What is claimed is:

1. A method for reconstructing an image of an object, comprising:

imaging the object using a first imaging modality to produce a first reconstructed image;

mapping optical properties of the object to the reconstructed image volume; and

detecting optical signals emitted from the object using a second imaging modality to produce a second reconstructed image, based on the mapped optical properties.

2. The method of claim 1, wherein the first reconstructed image shows two or three dimensional structural details of the object.

3. The method of claim 1, wherein the second reconstructed image shows two or three dimensional distribution of light emission from the object.

4. The method of claim 1, wherein the second reconstructed image is reconstructed for multiple types of source distributions with various spectral characteristics.

5. The method of claim 1, wherein the second reconstructed image is reconstructed from a single or multiple angles of view.

6. The method of claim 1, wherein the second reconstructed image is reconstructed using an iterative or analytic approach.

7. The method of claim 1, wherein the step of detecting optical signals uses sensors.

8. The method of claim 7, wherein the step of detecting optical signals also uses optical path components.

9. The method of claim 1, wherein the second reconstructed image shows cross-sectional or volumetric views of the object or quantitative features of underlying source distributions of the object.

10. The method of claim 1, wherein the optical properties include at least one of absorption coefficients, scattering coefficients, scattering anisotropy, indices of refraction, and features of underlying sources.

11. The method of claim 1, wherein the first imaging modality includes at least one of x-ray computed tomography, micro computed tomography, magnetic resonance imaging, and ultrasound.

12. The method of claim 1, wherein the second imaging modality includes at least one of bioluminescent tomography and fluorescent tomography.

13. The method of claim 1, further comprising segmenting the first reconstructed image into regions, wherein the step of mapping maps the optical properties to each segmented region of the image.

14. The method of claim 1, further comprising registering the first reconstructed image with the detected optical signals before producing the second reconstructed image.

15. The method of claim 14, wherein the step of registering uses a landmark-based method, a land-mark free method, or an optical surface imager method.

16. A system for reconstructing an image of an object, comprising:

a first imaging device for imaging the object using a first imaging modality to produce a first reconstructed image;

a library of optical properties of the object;

a processor for mapping the optical properties of the object to the first reconstructed image; and

a second imaging device for detecting optical signals emitted from the object using a second imaging modality to produce a second reconstructed image, based on the mapped optical properties.

17. The system of claim 16, wherein the first reconstructed image shows two or three dimensional structural details of the object.

18. The system of claim 16, wherein the second reconstructed image shows two or three dimensional distribution of light emission from the object.

19. The system of claim 16, wherein the second reconstructed image is reconstructed for multiple types of source distributions with various spectral characteristics.

20. The system of claim 16, wherein the second reconstructed image is reconstructed from a single or multiple angles of view.

21. The system of claim 16, wherein the second reconstructed image is reconstructed using an iterative or analytic approach.

22. The system of claim 16, wherein the second imaging device uses sensors for detecting the optical signal emissions.

23. The system of claim 22, wherein the second imaging device further comprises optical path components.

24. The system of claim 16, wherein the second reconstructed image shows cross-sectional or volumetric views or quantitative features of the underlying source distribution(s).

25. The system of claim 16, wherein the optical properties include at least one of absorption coefficients, scattering coefficients, scattering anisotropy, indices of refraction, and features of underlying sources.

26. The system of claim 16, wherein the first imaging modality includes at least one of x-ray computed tomography scan, micro computed tomography scan, magnetic resonance imaging, and ultrasound.

27. The system of claim 16, wherein the second imaging modality includes at least one of bioluminescent tomography and fluorescent tomography.

28. The system of claim 16, wherein the processor segments the first reconstructed image into regions and maps the optical properties to each segmented region of the image.

29. The system of claim 16, wherein the processor registers the first reconstructed image with the detected optical signals before the second reconstructed image is produced.

30. The system of claim 29, wherein the processor performs registration using a landmark-based method, a landmark-free method, or an optical surface imager based method.